

TOY TOP SPINDLE AND ASSEMBLY USING COMPACT DISCS

Field of the Invention

[0001] The invention relates to a spinning toy top which is hand driven and to which the rotational inertia member is readily obtained and configurable to suit a desired application.

Background of Invention

[0002] The invention comprises a toy top spindle wherein the top spindle is designed to use one or more compact discs to serve as a rotational inertia member and thus form a toy top assembly. The compact disc may have one or more labels containing printed matter affixed to its surface to enhance its visual appeal. Compact discs and their associated technology were developed by Philips Electronics N.V. of Holland during the late 1960's and are presently widely used and available for electronically recording, storing or playing back audio, video, textual, computer code, gaming software or other mediums in digital form. Software and disk shaped adhesive labels for identifying or enhancing the appearance of compact discs are also widely available with the Fellowes Corporation providing one such product called "Neato". Specifically, the top spindle is hand driven and may be packaged alone, with a blank compact disc, with a label, or with a label already affixed to a compact disc to form an appealing toy top assembly.

[0003] Tops have been in existence since antiquity with one of the earliest known examples dating from 3500 B.C. being made entirely of clay and found in the ancient city of Ur near Bagdad, Iraq. Ceramic spinners have been found in Turkey dating from 3000 B.C. and Roman tops made of bone have been found dating from 27 B.C. Many variations of tops have been made including hand spun twirlers, supported cones spun by a cord which is pulled after being wound about the spinning axis and throwing tops, which have a cord wrapped around the top itself and which when thrown induces the spinning phenomenon.

[0004] All tops share the common feature of spinning about an axis while remaining stable upright. The physics of a spinning top is in part governed by the law of

conservation of angular momentum. Angular momentum is equal to the rotational inertia, being an integration of mass times the square of the distance of the mass to a spinning axis, multiplied by the rotational or angular velocity. Greater angular momentum generally results in a more prolonged spin.

[0005] The ability of a top to remain stable and upright while spinning is influenced by the uniformity of the rotational inertia about the spinning axis. Non-uniformity will cause the top to quickly become unstable and fall over in a short amount of time. For this reason, it is advantageous to create a top which has a high degree of rotational inertia symmetry about its spinning axis. As a top loses speed due to frictional losses it will eventually precess about its spinning tip in addition to spinning about its spinning axis. The speed of decay from stable spinning to precessing to unstable is partially influenced by the distance of the center of gravity of the entire top assembly above its spinning tip. A greater distance will generally result in a more rapid rate of decay to unstable, analogous to the instability of an inverted pendulum. Consequently, it is generally advantageous to have a low center of gravity rather than a high one.

[0006] Tops have been made as amusement devices for children and adults for a very long time and in a multitude of forms. The ability of an individual to create a top on his or her own which is stable and which spins for a long duration is limited mainly by an individual's ability to create a uniform rotational inertia member and a suitable center of gravity height. The present invention takes advantage of the widely available compact disc media storage device commonly used in computers, games and other digital devices and which, being made to precise industry standard dimensions, provides a very uniform rotational inertia. These industry standards address the need to minimize and control rotational vibration when spinning at high speeds in a compact disc drive. When a compact disc is added as a rotational inertia member to the top spindle according to this invention, a device is created that is stable, spins for a long duration, amuses, and which may be personalized or have added appeal by the addition of labels to the compact disc surface.

[0007] It is common knowledge that the trajectory of the sun relative to an earth observer varies as a function of the time of day, day of the year and the observer's geographical position. The well known sundial includes a planar surface with markings and a vertical

element known as a gnomon to translate this function into a time of day. This translation occurs by observing where the shadow of the edge of the gnomon intercepts markings on the planar surface of the sundial. According to archeological evidence, Viking sailors discovered that the shadow projected by the tip of a gnomon onto a platform traced a predictable and repeatable curvilinear path during the course of a day for a given latitude and time of year. Referred to as a "Viking Sun Compass" in modern literature, when the device was held in a horizontal plane with the platform oriented to the angular position where the shadow of the tip of the gnomon intercepted the curvilinear path, the ancient navigator could identify a vessel's heading with remarkable accuracy by following bearing markings on the oriented platform surface. An example of this early navigational device was found between 1946-1948 in Greenland and was dated to about 1000AD. The device contained multiple curvilinear forms thought to represent different sailing seasons as well as numerous triangular shaped circumferential bearing markings. The present invention includes a planar surface and a vertically projecting point, which, in addition to providing the tip for the top to spin about, may serve equally as well as a gnomon for use as a rudimentary navigational device when the top assembly is held inverted and in a horizontal plane.

[0008] The invention differs from prior art in multiple respects. U.S. Pat. No. 1,139,119 describes a toy top design comprising a spindle with shoulders onto which a disc is attached, but additionally adds a transparent celluloid cover over printed advertising matter according to its claim 1. Additionally it claims the entire assembly as a new article of manufacture whereas the present invention may be manufactured as a top spindle alone and to which the user may attach his or her own rotational inertia member in the form of a single or multiple compact discs. An additional difference found in the present invention is that the toy top may be inverted and then function as a navigational compass as a result of the spinning tip projecting a shadow onto a label placed on the gnomon side surface of the compact disc. Furthermore, the present wide availability and functionality of compact disc labeling software makes the invention uniquely simple to customize for a given application.

[0009] U.S. Pat. No. 5,755,608 describes a top spindle designed to be used in connection with components of the "K'NEX" construction toy set. The retaining means for

the components according to its claim 1. c) comprise a set of upwardly projecting lugs which engage the construction part whereas the present invention retains the rotational inertia member with no such lugs. Additionally, its claim 1. e) describes an upwardly projecting hub with the addition of its claim 1. f) of an interference fit on the inertial member. The present invention makes no claim on projecting hub orientation and in addition claims a clearance fit between the hub and the rotational inertia member.

[0010] U.S. Pat. No 4,954,116 claims an internally threaded flywheel, or rotational inertia member, according to its claim 1 which differs from the present invention in that a smooth hole in the compact disc is used in the rotational inertia member or flywheel.

[0011] U.S. Pat. No 6,364,734 B1 claims a plurality of weights and springs in the inertial member according to claim 1, which again differs from the present invention in that the inertia properties of the top assembly remains constant during the duration of a spin.

[0012] Other patents illustrative of the art include

U.S. Pat. No. 5,020,798

U.S. Pat. No. 4,772,241

U.S. Pat. No. 2,897,066

[0013] Upon review it is seen that the present invention differs from prior art relating to toy tops and is unique in multiple respects. Additionally, an unclaimed advantage of the present invention over said prior art lies in its manufacturing. All top spindle, spinning tip and grip stem claims allow the articles to be made complete on a standard lathe or screw machine with no secondary operations. Additionally, the invention is specifically designed to be used with a rotational inertia member in the form of a compact disc which the consumer can often obtain for free or at minimal cost. Also, due to the fact that compact discs are required to be manufactured to precise industry standards to control uniformity in rotational inertia and physical dimensions, the spindle may be offered alone with no particular hindrance to the ability of the user to create an assembled toy top.

Summary of the Invention

[0014] It is the object of the invention to provide a toy top article comprising a top spindle or separate grip and spinning tip to which the user may readily attach a single or multiple compact discs to form a rotational inertia member and thus create a toy top assembly.

[0015] Another object is to meet the above objective and provide a label which includes printed matter to affix to the rotational inertia member in order to make the device more appealing or to advertise a product, event, business or other item.

[0016] Another object is to meet the above objective such that the appeal of the affixed label as a part of the top assembly renders it and the associated compact disc, with or without digital information encoded upon it, more likely to be retained rather than simply thrown away as standard advertising literature and informational compact discs often are.

[0017] Another object is to provide a rotational inertia member containing a label with curvilinear forms printed on it such that when the toy top is inverted, the spinning tip functions as the gnomon of a rudimentary navigational device.

[0018] The invention achieves the above objectives with a multitude of top spindle, spinning tip, gripping stem and label design configurations which when assembled form a stable and appealing spinning toy top assembly.

Brief Description of the Several Views of the Invention

[0019] For a better understanding of exemplary embodiments of the present invention, reference is made to the following descriptions, considered with the accompanying referenced drawings, in which:

[0020] Figure 1 is a perspective and elevation view of an exemplary embodiment of the toy top device;

[0021] Figure 2 is a plan and elevation view of the rotational inertia member comprising a compact disc and a planar surface label;

[0022] Figure 3 is an elevation view of exemplary embodiments of the top spindle and shoulder pairs;

[0023] Figure 4 is an elevation view of exemplary embodiments of the gripping stem and grasping features;

[0024] Figure 5 is an elevation view of exemplary embodiments of the spinning tip, end tip and rotational inertia member alignment means;

[0025] Figure 6 is a perspective view of an exemplary embodiment of the toy top device inverted and having a label containing a curvilinear form on the spinning tip side of the compact disc to thereby form a navigational device.

Detailed Description of the Invention

[0026] Although the present invention can be adapted to utilize rotational inertial members in a variety of shapes and styles, it is particularly well suited to utilize a single or plurality of commonly available compact disc media storage disks for this purpose.

[0027] Figure 1 illustrates the toy top assembly 3 with a top spindle 1 clamping a compact disc serving as a rotational inertia member 2 between a shoulder pair 45 comprised of a nut 14 and a flanged portion of a bearing platform 10 of the top spindle 1. The spinning knob 12 is grasped and then twirled by the user in order to create the spinning effect.

[0028] Figure 2 illustrates the rotational inertia member 2 being a compact disc that is of predetermined dimensions giving it uniform rotational inertia properties and is standardized so that multiple manufacturers may design electronic devices that utilize the discs. Accordingly, the disc includes a central opening hole 5 of a prescribed diameter and a mounting hub flange 4 having a predetermined thickness. These properties are ostensibly specified and controlled for proper function in an electronic compact disc drive, however, in the present invention they are utilized to create the toy top assembly 3. The low placement of the dimensionally controlled and highly uniform rotational inertia member 2 relative to the spinning tip 6 lends itself to making the toy top assembly 3 stable during spinning. A label 11 affixed to the surface of the rotational inertia member comprises one or more patterns, pictures, logos, shapes, colors or text 29 in order to enhance the overall appearance of the top design. The label can be created manually through the use of any number of readily available software packages and or label kits intended for this purpose. It is also possible that any patterns, pictures, logos, shapes, colors or text 29 may be printed on or directly etched, painted or silk screened onto the surface of the compact disc itself.

[0029] Figure 3 illustrates two embodiments of the top spindle 1 which integrates a spinning tip 6, a threaded cylinder 7, a locating hub 9, a bearing platform 10 and a gripping stem 8 all into one piece. The spinning tip 6 is shown as terminating in a point, however, it may also be a round spherical shape 36 or a generally round feature 35 such as a parabola as depicted in figure 5. The point or rounded feature of the spinning tip

serves to minimize contact of the toy top 3 with a spinning surface in order to reduce frictional losses that would create a shorter spinning duration. A nut 14, threaded boss 30, o-ring 15, or washer 16 may all be used in place of or in conjunction with the bearing platform 10 to form a shoulder pair by which to clamp a compact disc rigidly to the top spindle 1. Figure 3 depicts the threaded cylinder 7 being axially adjacent, below in one embodiment and above in the other, the bearing platform 10. The exemplary embodiments shown allow the compact disc to be assembled onto the top spindle 1 from either the spinning tip 6 side or the gripping stem 8 side. The bearing platform 10 provides a flanged surface that the compact disc may be clamped against in the toy top assembly 3. The integral gripping stem 8 has on its upper end a spinning knob 12 which contains grasping features 13 to enable the user to spin the top more uniformly and at a higher angular rate of speed. These features generally increase contact friction with the users twirling fingers and can include knurled 17, upset 18, machined 19, adhesive 20, grooved 21 or embedded aggregate 22 as shown in figure 4. The adhesive gripping feature 20 may be in the form of a tacky or rubber like applied coating. The embedded aggregate 22 may be in the form of an adhesive type base in which particles such as silicon carbide are embedded to increase gripping friction. The spindle may be constructed of any number of materials including brass, steel, aluminum, wood or plastic. The symmetrical design of the spindle allows it to be manufactured in its entirety on a simple lathe.

[0030] Figure 4 illustrates two embodiments of a discrete gripping stem 31 which is intended to adapt to discrete spinning tip 32 embodiments shown in figure 5. The depicted gripping stems both contain the same locating hub 9, bearing platform 10, spinning knob 12 and grasping features 13 as previously discussed, however, they also contain a lower end threaded portion in order to engage the separate spinning tip 32. In one embodiment shown, the threaded feature consists of a male externally threaded shaft 23 and in the other embodiment it consists of a female internally threaded hole 24. In both embodiments the rotational inertia member 2 is clamped between the gripping stem 31 and the spinning tip 32 in the completed toy top assembly 3. A locating hub 9 may or may not be present in the invention. In the case where it is not present, an alternative means of aligning the rotational inertia member 2 central opening hole 5 with the spinning

axis is contemplated in figure 5 with the addition of another part which may consist of a straight or tapered hub 25, a washer 26, a flanged boss 27, or o-rings 28. In all cases the contemplated means would still be required to have an outside diameter less than or equal to the central opening hole 5 in order to properly engage and align the compact disc to the spinning axis. The gripping stem 31 may be constructed of any number of materials including brass, steel, aluminum, wood or plastic. The symmetrical design of the gripping stem allows it to be manufactured in its entirety on a simple lathe.

[0031] Figure 5 illustrates two embodiments of a discrete spinning tip 32 which is intended to adapt to a discrete gripping stem 31 previously discussed. Spinning tip 32 may be pointed or rounded as previously discussed and also contains the same bearing platform 10 and locating hub 9 features also previously discussed. However, the embodiments shown also contain an upper end threaded portion in order to engage a separate gripping stem 31. In one embodiment shown, this threaded feature consists of a male externally threaded shaft 34 and in the other embodiment it consists of a female internally threaded hole 33. In both embodiments the rotational inertia member 2 is clamped between the discrete gripping stem 31 and the discrete spinning tip 32 as previously discussed. The locating hub 9 may or may not be present in the invention. In the case where it is not present, an alternative means of aligning the rotational inertia member 2 central opening hole 5 with the spinning axis is contemplated in the same manner as previously discussed. The spinning tip may be constructed of any number of materials including brass, steel, aluminum, wood or plastic. The symmetrical design of the spinning tip allows it to be manufactured in its entirety on a simple lathe.

[0032] Figure 6 illustrates an alternate application of the toy top assembly 3 when it is held inverted on a horizontal plane. The spinning tip, 6 if integral or 32 if discrete, will cast a shadow 42 on the rotational inertia member 2 surface when exposed to a light source originating from a position above the plane of the rotational inertia member 2. The sun, as a light source itself, moves in an arcuate path 37 relative to a stationary earth position during the course of a day and will have a varying declination during the course of the year. Arcuate path 37 represents a winter month and arcuate path 38 represents a summer month for an observer in earth's northern hemisphere. During the course of a day the sun will continuously move from 39 to 40 to 41 relative to the observer. These

discrete positions might represent morning, noon and evening respectively. On the surface of the rotational inertia member 2, an arcuate curvilinear form 44 which follows the path traced by the tip of the spinning tip 6 or 32 during the course of a day allows the observer to rotationally align the inverted toy top assembly 3 to a deterministic position relative to earth. By aligning the shadow from the spinning tip 6 or 32, the user may thereby orient him or herself to markings or textual notations 43 on the surface of the rotational inertia member 2 or on a label 11 affixed to the rotational inertia member 2 in order to establish a bearing. Such curvilinear forms for different months and geographical latitudes placed onto the rotational inertia member 2 allow the present invention to serve as a rudimentary navigational device in addition to a toy top 3.

[0033] Having described the illustrated embodiments, it will become apparent that various modifications can be made without departing from the scope of the invention as defined in the accompanying claims.